Early experience of gynecologic robotic surgery in a tertiary government hospital*

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ABSTRACT

Background: Robotic surgery is a form of minimally invasive surgery wherein the surgeon controls the camera and instruments in a console, remote from the operating room table. Currently, the system in place is the da Vinci Surgical System which was approved by the United States Food and Drug Administration in 2000 for laparoscopic surgery. Since its approval in 2005 for Gynecologic procedures, the da Vinci Surgical System has been used for hysterectomies, lymph node dissections, sacrocolpopexies, myomectomies, and cerclage.

Objective: This paper presents the initial seven cases of benign gynecologic diseases operated on utilizing the da Vinci Surgical System in our institution – six hysterectomies and one myomectomy.

Methodology: Seven gynecologic surgeries that utilized the da Vinci Surgical System in 2019 until the first quarter of the year 2020 were done. Medical records of the seven patients were reviewed.

Results: The average docking time was 38 minutes (range: 25 – 65 minutes) and the average console time was 227 minutes (range: 175 – 345 minutes). The average blood loss was 576 cc (range: 80 – 1200 cc). No cases converted to an abdominal laparotomy and no morbidities were reported. While two cases underwent blood transfusion intraoperatively, all cases were stable post-operatively and were for discharge after two days. On follow-up, all patients were stable with an unremarkable clinical course.

Conclusion: Our initial experience demonstrates that robotic surgery appears as a viable alternative to traditional approaches. As more cases are to be done in the future, fine-tuning of the logistical set-up and surgical skills are expected, as well as venturing into other gynecologic diseases such as malignancies. Further research must be conducted on various aspects of robotic surgery, such as but not limited to outcome comparison with traditional and other laparoscopic approaches, long term outcomes, patient safety, and patient experience and preference, among others.

Keywords: Gynecologic surgery, minimally invasive surgery, robot-enhanced surgery

INTRODUCTION

Since 1978, various machines have been developed to mimic human movement and aid physicians to create more precise movement and afford better access and visualization in the operative field.[1] Robotic surgery is a form of minimally invasive surgery wherein the surgeon controls the camera and instruments in a console, remote from the operating room table. Currently, the system used is the da Vinci Surgical System which was initially designed to be used in the battlefield, but was eventually redesigned and approved by the United States Food and Drug Administration in 2000 for laparoscopic surgery.[1] It contains three components: 1) a three-dimensional highdefinition vision system; 2) a robotic platform containing 3 or 4 robotic arms that hold the Endowrist instruments, and the camera, which are inserted through trocars attached to the patient and; 3) the surgeon's console where the surgeon sits and views the screen and controls the instruments and cameras through finger graspers and foot pedals.[2] The advantages of robot-assisted surgery on patient outcomes, include decreased blood loss, quick recovery, decreased hospital stay, less pain and better cosmesis.[2] In terms of the technology, benefits of robot-assisted surgery are tremor filtration, intuitive hand movements, and an ergonomic design.[2]

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Since its approval for surgical use, various specialties have utilized the da Vinci Surgical System, namely Otolaryngology, Gastrointestinal surgery, Urology, Cardiothoracic surgery, and Gynecology.[3] Since its approval in 2005 for Gynecologic procedures, the da Vinci Surgical System has been used for hysterectomies, lymph node dissections, sacrocolpopexies, myomectomies, and cerclage.[2,4] As of September 2019, there are 5,406 units installed worldwide, 3 of which are in the Philippines. There are 2 units in two private institutions, and 1 unit in a government institution. Since its installment in April 2019, the da Vinci Surgical system has been used by our institution by the General Surgery, Urology and Gynecology services.

OBJECTIVES

This paper presents the first seven robot-assisted gynecologic procedures done in a tertiary government hospital in the Philippines.

MATERIALS AND METHODS

Seven gynecologic surgeries that utilized the da Vinci Surgical System in 2019 until the first quarter of the year 2020 were done. Chart review was done at the Medical Records Section. The following information were obtained: patient profile and demographics, preoperative patient preparation, intraoperative course, intraoperative findings, postoperative course and recovery, and problems encountered.

The study protocol was approved by the institution's Research Ethics Board.

CASES:

Case 1

AB is a case of endometrial polyp with atypical stromal cells in a 60-year-old nulligravid, with a chief complaint of thickened endometrium on ultrasound. She is a known case of Breast Cancer Stage IIA, left, who underwent modified radical mastectomy and was on Tamoxifen for 4 years. She has no other co-morbidities. Transrectal ultrasound revealed thickened endometrium described as hyperechoic measuring 2.0 cm thick with multiple irregular cystic spaces. She underwent hysteroscopic polypectomy which revealed endometrial polyp with atypical stromal cells. Internal examination was essentially normal with a small corpus size.

She underwent robot-assisted total hysterectomy with bilateral salpingo-oophorectomy (THBSO), diagnostic cystourethroscopy under general endotracheal anesthesia and tolerated the procedure well. She was discharged 2 days after the procedure. The histopathologic findings revealed an endometrial polyp, cystic atrophic endometrium, and chronic cervicitis with nabothian cysts. The bilateral adnexa were unremarkable.

Follow-up was unremarkable. Vaginal stump was intact. The wounds were dry and wellcoaptated with no erythema and no discharge.

Case 2

CD is a case of abnormal uterine bleeding secondary to endometrial hyperplasia with atypia in a 51-year-old Gravida 2 Para 2 (2002), with a chief complaint of heavy menstrual bleeding. She is a known hypertensive for 24 years with good compliance to amlodipine. On ultrasound, there was an incidental finding of gallbladder stones. Workup revealed impaired fasting glucose and dyslipidemia.

She had a four-year history of prolonged and heavy menstrual bleeding consuming 10 moderately to fully soaked pads per day, lasting for 7 to 10 days. Transvaginal ultrasound revealed thickened endometrium and endometrial biopsy revealed unremarkable results. She was started on Depot Medroxyprogesterone Acetate (DMPA) every 3 months and monitored accordingly. However, 2 months prior to admission, there was recurrence of heavy menstrual bleeding prompting consult. Repeat transvaginal ultrasound still revealed thickened endometrium and repeat biopsy showed strips of endometrial type epithelium with atypia. Pertinent internal examination finding revealed a corpus size of 8-10 weeks.

She underwent robot-assisted extrafascial hysterectomy with bilateral salpingooophorectomy (EHBSO), diagnostic cystourethroscopy, robot-assisted cholecystectomy under general endotracheal anesthesia and tolerated the procedure well. She was cleared for discharge 2 days after the procedure. The histopathologic findings revealed a leiomyomata uteri (subserous and intramural), adenomyosis, and late proliferative endometrium. There was chronic cervicitis with squamous metaplasia. There was also endometriosis involving fibrovascular and adipose tissues in the bilateral adnexal area. The gallbladder examination revealed chronic cholecystitis with cholesterolosis.

Follow-up was unremarkable. Vaginal stump was intact. The wounds were dry and wellcoaptated with no erythema and no discharge.

Case 3

EF is a case of abnormal uterine bleeding secondary to adenomyosis in a 47-year-old Gravida 3 Para 3 (3003), with a chief complaint of heavy menstrual bleeding. She has no known co-morbidities. She previously underwent bilateral tubal ligation in the year 2005.

She had a 10 day history of heavy menstrual bleeding soaking up to 4 diaper pads per day, associated with hypogastric pain. Transvaginal ultrasound revealed an enlarged anteverted uterus with sonologic features suggestive of adenomyosis, thin endometrium with hematometra, normal right ovary, and left ovarian cyst consider physiologic cyst. Pertinent internal examination finding revealed a corpus size of 10-12 weeks.

She underwent robot-assisted THBSO, diagnostic cystourethroscopy under general endotracheal anesthesia and tolerated the procedure well. She was for discharge 2 days after the procedure. The histopathologic findings revealed adenomyosis, chronic salpingitis and paratubal cysts on the left fallopian tube, proliferative endometrium, chronic cervicitis with squamous metaplasia, and nabothian cysts. The bilateral adnexa were unremarkable. Follow-up was unremarkable. Vaginal stump was intact. The wounds were dry and wellcoaptated with no erythema and no discharge.

Case 4

GH is a case of multiple myoma uteri in a 44-year-old Gravida 3 Para 2 (2012), with a chief complaint of hypogastric pain. She has no known co-morbidities.

She had a six-month history of hypogastric pain with a numerical rating scale of 8/10. There was no history of bleeding. Transvaginal ultrasound revealed a prolapsed submucous myoma measuring 4.2 x 3.4 x 1.6 cm which seemed to be attached to the posterior uterine isthmus by a pedicle measuring 2.1 x 0.8 cm, and dilating the internal cervical os (FIGO 0). She had an enlarged uterus with multiple myoma uteri – intramural, intramural with submucous component, and intramural with subserous component (FIGO 0,2,4,5,6). The endometrium was suggestive of secretory phase, with normal ovaries. Pertinent internal examination finding revealed a 3x3 cm firm mass dilating the cervix, which was non-necrotic and non-foul smelling and a corpus size that was enlarged to 12-14 weeks.

She underwent robot-assisted total hysterectomy with bilateral salpingectomy (THBS), diagnostic cystourethroscopy under general endotracheal anesthesia and tolerated the procedure well. She was for discharge 2 days after the procedure. The histopathologic findings revealed leiomyomata uteri (one submucous, twelve intramural, four subserosal), proliferative endometrium and chronic cervicitis with squamous metaplasia. The bilateral fallopian tubes were unremarkable.

Follow-up was unremarkable. Vaginal stump was intact. The wounds were dry and wellcoaptated with no erythema and no discharge.

Case 5

IJ is a case of abnormal uterine bleeding secondary to adenomyosis with adenomyoma in a 45-year-old Gravida 2 Para 2 (2002), with a chief complaint of hypogastric pain.

She had a three year history of hypogastric pain during menstruation with a numerical rating scale of 6/10. One year prior to admission, there was increase in menstrual flow, from soaking 4 pads per day to 3 diaper pads per day. A transvaginal ultrasound revealed sonologic findings suggestive of adenomysosis with adenomyoma, thin endometrium, and normal ovaries. Internal examination was essentially normal with a small corpus size.

She underwent robot-assisted THBSO under general endotracheal anesthesia and tolerated the procedure well. She was discharged 2 days after the procedure. The histopathologic findings revealed adenomyosis, secretory phase endometrium, and chronic cervicitis. There was a paratubal cyst at the left fallopian tube. The bilateral adnexa were unremarkable.

Follow-up was unremarkable. Vaginal stump was intact. The wounds were also dry and well-coaptated with no erythema and no discharge.

Case 6

KL is a case of myoma uteri in a 41-year-old nulligravid, with a chief complaint of abdominal enlargement. She has no known co-morbidities. She previously underwent appendectomy last 2012.

She had a one month history of abdominal enlargement with no associated vaginal bleeding. An ultrasound done revealed a subserous myoma and normal adnexa. Pertinent internal examination findings revealed a uterus that was nodular, enlarged to 12-14 weeks in size, with a movable, soft mass, measuring 8.0 x 7.0 x 7.0 cm on the right antero-lateral uterine wall.

She underwent robot-assisted myomectomy under general endotracheal anesthesia and tolerated the procedure well. She was discharged 2 days after the procedure. The histopathologic findings revealed leiomyoma in fragments.

On follow-up, she had stable vital signs with essentially normal systemic findings. However, there was note of abrasions on the anterior abdominal wall, due to contact with the posterior part of the camera during the operation. On succeeding follow-up, there was note of adequate healing and decrease in the erythematous areas of the abrasions. On internal examination she had normal external genitalia, nulliparous vagina, cervix was smooth, soft, no masses, no erosions. The uterus was small and the adnexa, parametria, and rectovaginal areas were smooth and pliable.

Case 7

MN is a case of abnormal uterine bleeding secondary to adenomyosis and endometrial polyp in a 48-year-old Gravida 2 Para 2 (2002), with a chief complaint of vaginal bleeding. She is a known hypertensive for 3 years and is

maintained on amlodipine with good compliance.

History started 4 years prior to admission wherein the patient noted profuse vaginal bleeding associated with hypogastric pain. Consultation done at another institution recommended dilatation and curettage which resulted to eventual relief of symptoms. Patient was well until 1 year prior to admission there was recurrence of the vaginal bleeding. She was managed as a case of adenomyosis, and was given one dose of DMPA and three doses of gonadotropin-releasing hormone agonist. Transvaginal ultrasound revealed normal-sized anteverted uterus with sonographic findings suggestive of adenomyosis, thickened endometrium consider endometrial pathology, and normal ovaries. An endometrial biopsy done showed endometrial polyp and disordered proliferative endometrium. Pertinent internal examination finding revealed a corpus size of 10-12 weeks.

She underwent robot-assisted THBSO under general endotracheal anesthesia and tolerated the procedure well. She was for discharge 2 days after the procedure. The histopathologic findings revealed uterine leiomyomata (intramural and subserosal), adenomyosis, chronic cervicitis and squamous metaplasia and proliferative endometrium. There were paratubal cysts, at the right and left fallopian tube. The bilateral adnexa were unremarkable.

Follow-up was unremarkable, with an intact vaginal stump. The wounds were also dry and well-coaptated with no erythema and no discharge.

RESULTS AND DISCUSSION

Patient Profile and Selection

Seven patients with benign conditions were operated on utilizing the da Vince Surgical System, six under the Charity service and one under the Pay service. All patients underwent preoperative ultrasonography and the results were correlated clinically. Patient age ranged from 41-60 years old. Two cases were nulligravids and four were multigravids. On internal examination, the patients had corpus sizes equal to and less than 14 weeks age of gestation. The co-morbidities noted were: Breast Cancer (AB), hypertension (CD), dyslipidemia (CD), gallbladder stone (CD) and hypertension (MN). Two patients had previous abdominal surgeries: bilateral tubal ligation (EF) and appendectomy (KL). The mean Body Mass Index (BMI) was 25 (range = 23 – 30). Two cases were classified as Obese II and 5 were classified as Overweight using the Asia-Pacific guidelines for BMI.

Pre-operative Preparation

All patients had essentially normal systemic findings and cleared prior to surgery and categorized as having a low clinical risk. All patients had a low risk for deep vein thrombosis. Using the American Society of Anesthesiologist (ASA) physical status classification system, 5 cases were classified as ASA 1 and 2 cases as ASA 2 for a medical co-morbidity. All cases had a pre-operative hemoglobin of more than 100 g/L (range = 106 – 149).

Intraoperative Considerations

All cases were induced using general endotracheal anesthesia, utilizing sevoflurane. There were no anesthetic morbidities in all seven cases. On monitoring, there were no episodes of hypotension.

During the surgery, 2 table assists and 1 perineal assist aided the surgeon with the visualization.

Docking entailed placement of the trocars of the da Vinci Surgical System on the patient, and the average docking time was 38 minutes (range = 25 – 65 minutes).

Intraoperatively, all patients during panoramic view revealed no ascites, and the abdominal organs were smooth and grossly normal on visualization. However, CD had dense adhesions between the uterine corpus and the omental tissue. This was assessed to be pelvic endometriosis which was consistent with the final histopathologic finding. Good visualization of the tissues aided in the adhesiolysis. The first 4 patients entailed diagnostic cystourethroscopy which revealed no bladder defects, with both ureteral orifices visualized adequately, and with good movement and efflux of urine. The last 3 patients did not undergo diagnostic cystourethroscopy. All patients had good visualization of the ureter and no ureteral morbidities were noted.

Table 1. Intraoperative Considerations

Cases	1 (AB)	2 (CD)	3 (EF)	4 (GH)	5 (IJ)	6 (KL)	7 (MN)
OR performed	THBSO	EHBSO	THBSO	THBS	THBSO	Myomectomy	THBSO
Docking time (minutes)	65	45	35	30	30	25	35
Average Docking time (minutes)	38						
Console time (minutes)	205	345	195	200	205	175	265
Average console time (minutes)	227						
Blood loss (cc)	80	450	700	500	700	400	1200
Average blood loss (cc)	576						

Two cases were aided with morcellation of the specimen – morcellation at the vagina to aid the removal of the specimen in the vaginal introitus (IJ) and morcellation to facilitate removal of the specimen through the umbilicus (KL).

The mean blood loss was 576 cc (range: 80 – 1,200 cc). Two cases had intraoperative transfusion – prophylactic in IJ, and for MN because of an estimated blood loss of 1,200 cc. All patients had stable vital signs post-operatively and no post-operative transfusions were done. For the 5 cases with a post-operative complete blood count, the hemoglobin was above 100 g/L (range: 111 – 142).

The console time, which is calculated from the start of the surgery after docking until the primary surgeon finishes the surgery, averaged 227 minutes (range: 175 – 265 minutes). There were no conversions to abdominal laparotomies.

Post-operative considerations

There were no major post-operative morbidities. All patients were stable with normal systemic findings. There were no febrile episodes or thrombotic events. All patients tolerated regular diet on the first post-operative day and were for discharge by the second post-operative day. Patients who underwent hysterectomy had intact stumps. The incision sites of the trocars were dry and well-coaptated. However, KL had abrasions on the anterior abdominal wall probably due to the posterior part of the camera of the robot coming in contact with the abdomen during the surgery. On succeeding follow-up there was a decrease in the abrasions with adequate healing.

Problems Encountered

Initially there were difficulties in the docking and the placement of the trocars. However the docking improved from initially being 65 minutes to 35 minutes in the seventh case performed, with a mean docking time of 38 minutes (range = 25 – 65 minutes). Appropriate trocar size was integral in ensuring stability of the robotic arms. As patients were placed in the Trendelenberg position, there was initial difficulty in keeping the patient in place. Patients should be positioned properly and secured accordingly prior to docking to decrease the difficulty with trocar placement and movement of the robotic arms.

There were also problems with the cautery machine (AB) due to faulty wiring which was promptly replaced. There was also initial problems with the apposition of the fenestrated forceps (MN) which led to difficulty with the grasping of tissues, but this was replaced immediately.

The first 4 cases utilized the Allan uterine manipulator. In the fifth case, the Advincula arch was initially used but due to difficulty with the positioning and maneuvering of this instrument, the team reverted back to the Allan uterine manipulator. This was subsequently used in the sixth case. Perineal assists have been retrained in the use of the Advincula arch in preparation for the seventh case, and the Advincula arch was utilized with ease during this operation.

As mentioned, there were abrasions on the abdomen of KL, possibly caused by the posterior portion of the camera. Future cases can utilize an abdominal binder to aid in the protection of the abdominal wall during camera manipulation during surgery.

Future Directions

Since the first operation, there have been major improvements in setting up and handling of instruments. The Gynecologic Robotic Team of our institution is scheduled for further training on malignant cases, and particularly in lymph node dissection. With our institution envisioned as a center of training in Robotic Surgery, more consultants will pursue training. This will broaden the variety and increase cases to be operated on. Fellows and senior residents will be trained on the basic set-up and will be responsible for the docking of the trocars and the machine. The training will help fulfill the mandate of our hospital as a training and service-oriented institution.

CONCLUSION AND RECOMMENDATIONS

The initial experiences in our institution with the first 7 cases utilizing the da Vinci Surgical System demonstrate that this approach appears as a viable alternative to the traditional abdominal and laparoscopic approaches for a variety of gynecologic cases. As more cases are to be done, fine-tuning of the logistical set-up and surgical skills will improve the outcomes of future cases. Further research should be conducted on various aspects of robotic surgery, such as utilization in other gynecologic diseases (i.e. malignancies), outcome comparison with traditional and other laparoscopic approaches, long term outcomes, patient safety, and patient experience and preference. ■

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